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LABORATORY WEARING TEST TO DETERMINE THE RELATIVE WEAR RESISTANCE OF SOLE LEATHER AT DIFFERENT DEPTHS THROUGHOUT THE THICKNESS OF A HIDE

BY

REEVES W. HART, Assistant Physicist

Bureau of Standards

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LABORATORY WEARING TEST TO DETERMINE THE RELATIVE WEAR RESISTANCE OF SOLE LEATHER AT DIFFERENT DEPTHS THROUGHOUT THE THICKNESS OF A HIDE

By Reeves W. Hart

The results given in this report are those obtained from a series of preliminary tests and must not be regarded as the data from extensive researches on this subject. They are, however, significant in that for each individual test of this series the same general tendency is shown.

The leather used for these tests was taken from a single hide and so marked that the relative location of each test piece could be ascertained. The 18 test pieces prepared for the machine-wearing test were divided into 6 groups, 3 of which were tested by wearing with the grain side out, and 3 by subjecting the flesh side to the wearing action. The 6 groups were prepared as follows:

TEST PIECES TO BE WORN ON THE GRAIN SIDE

*G*1, left the original thickness of the leather.
*G*2, made approximately two-thirds original thickness by skiving off one-third from the grain surface.
*G*3, made approximately one-third original thickness by skiving off two-thirds from the grain surface.

TEST PIECES TO BE WORN ON THE FLESH SIDE

*F*1, left the original thickness of the leather.
*F*2, made approximately two-thirds original thickness by skiving off one-third from the flesh side.
*F*3, made approximately one-third original thickness by skiving off two-thirds from the flesh side.

By this procedure test pieces were obtained at four different layers of the leather, the grain surface, a depth of one-third the thickness of the leather, a depth of two-thirds the thickness, and the flesh surface.

Three individual tests were made on the wearing-test machine with a sample representing each group in every test. The length of the runs was varied, but all the other conditions of the tests were kept as nearly constant as possible.

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The results of each of the three individual tests and also an average result of all of them are shown in the accompanying graphs. These graphs (Fig. 1) show the relative loss in weight of each sample as compared to the loss in weight of the sample *G*1, which was chosen as the basis for comparison. The arrangement of these graphs was based on the actual thickness of the test pieces. In each case there is a striking similarity between the results of the runs. From these data the outside surfaces of the leather appear to have much less resistance to wear than the interior portions of the hide. The grain surface has more resist-

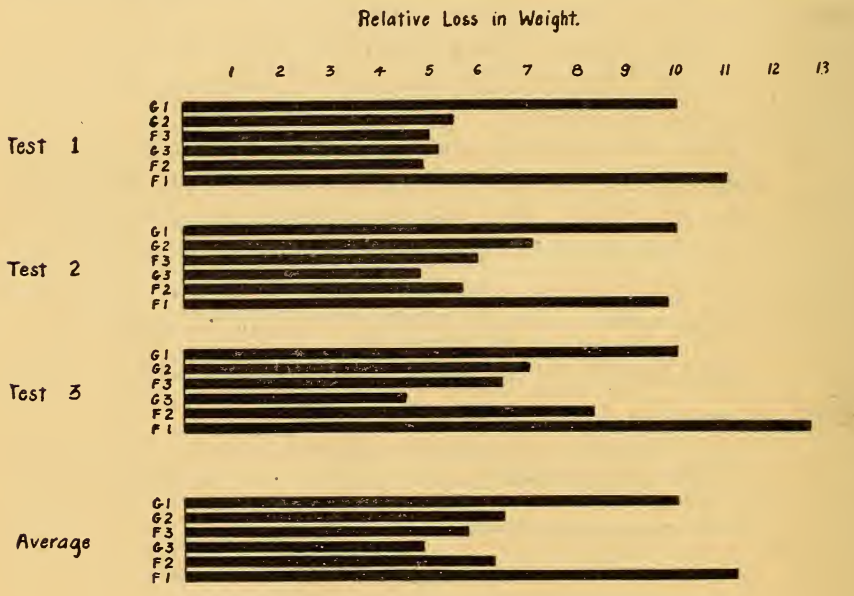

FIG. 1.—*Wear resistance at different depths of a hide*

ance than the flesh side, although this difference is not so marked as that between the outer and inner parts. Without extensive researches it would be impossible to locate the specific layer having the greatest wearing resistance, if any such surface exists, which is very doubtful.

There are several reasons to which this difference may be ascribed. It is probably due to a certain extent to the difference in the degree of tannage between the outer and the inner portions of the leather. The outer layers take up the tannin before the latter has a chance to penetrate to the interior of the hide; the tannins are precipitated in the surface layers and they, therefore, tend to retard the tanning of the central parts. In all pieces of

heavy leather the central part is probably much more lightly tanned than either the grain or the flesh surfaces. This may be clearly noticed in a piece of so-called undertanned sole leather.

A study of the anatomy of the hide itself discloses even greater reasons for this wide difference in wear resistance. The part of the skin that goes to make up the finished leather may be divided into two distinct parts, the grain and the flesh, or more correctly speaking, the corium. The chemical constitution and physical structure of these two divisions are quite different.

FIG. 2.—*Grain portion.* × 50

Briefly, the grain consists of the papillary layer, of bundles of very fine white and elastic fibers, and it contains the sudoriferous and sebaceous glands. These fine fibers are clearly defined, lying nearly flat and extending in every direction, closely interwoven and overlapping, sometimes even doubling back into the lower fibrous layers. Fig. 2 shows a cross section of the grain portion of a piece of lightly rolled union sole leather magnified to 50 diameters. The grain surface is seen as the dark portion at the top; beneath it may be seen the white fiber bundles with the glands scattered through them.

The corium, in Fig. 3, is composed of larger bundles or fine fibers, not so compactly interwoven as those of the grain portion.

There appears to be no system in which the fiber bundles interlace themselves, but, from his extensive researches on this subject, Alfred Seymour-Jones has concluded that these fiber bundles are woven in a definite steplike manner.[1]

The flesh side of the leather, Fig. 4, consists of smaller bundles of fibers closely interwoven and running more nearly parallel, forming a region similar to that formed by the white fibers of the grain.

FIG. 3.—*Corium.* × 50

The grain membrane itself has very little resistance to wear. It deteriorates rapidly, especially in dyed leathers, and peels off in little flakes. Sheepskin and morocco (goat) leather show this defect, although it has been noted to a less extent in cow leather.[2] The surfaces composed of the smaller bundles of fiber, although more compactly woven, do not possess the resistance of the larger, less closely knitted fiber bundles of the corium.

[1] A. Seymour-Jones, The physiology of the skin, Part XI.
[2] A. Seymour-Jones, The physiology of the skin, Part VI.

From the data obtained from this series of tests the interior portions of the leather appear to have a greater resistance to wear

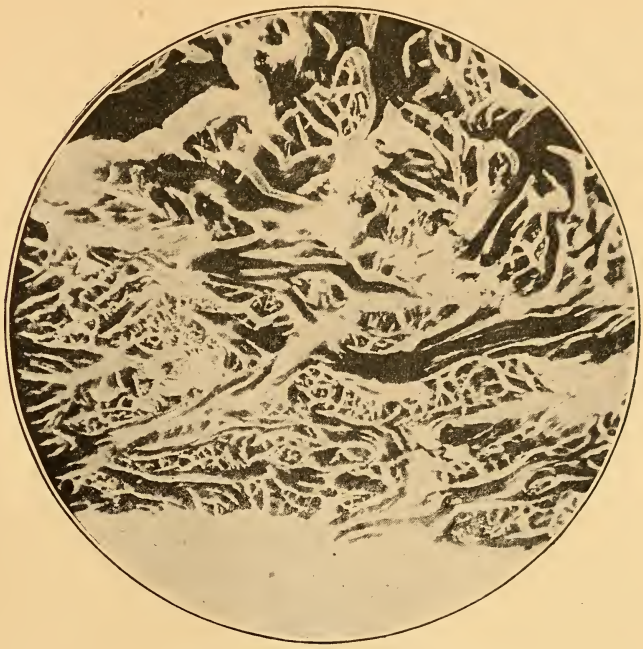

FIG. 4.—*Flesh portion.* × 50

than either the grain or the flesh sides. There is no specific surface which has the greatest wear resistance.

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